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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/873,287	06/05/2001	Tomio Sugiyama	MNL-2635-16	4759

23117 7590 02/09/2009

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EXAMINER	
OLSEN, KAJ K	

ART UNIT	PAPER NUMBER
1795	

MAIL DATE	DELIVERY MODE
02/09/2009	PAPER

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RECORD OF ORAL HEARING

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte TOMIO SUGIYAMA

Appeal 2008-6213
Application 09/873,287
Technology Center 1700

Oral Hearing Held: January 14, 2009

Before EDWARD C. KIMLIN, ADRIENE LEPIANE HANLON, and LINDA M. GAUDETTE, Administrative Patent Judges

ON BEHALF OF THE APPELLANT:

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THE USHER: Calendar Number 29. Appeal Number 2008-6213. Ms. Lester.

JUDGE KIMLIN: Good afternoon, Ms. Lester.

MS. LESTER: Hi there.

JUDGE KIMLIN: Our reporter today is Vicky Wilson. If you have a business card for her, she would appreciate it.

MS. LESTER: I don't. Sorry.

JUDGE KIMLIN: If not, you can give her the relevant information that she needs.

MS. LESTER: Sure. Sure.

(Discussion off the record.)

MS. LESTER: The case I'm here to discuss today relates to a multi-layered gas sensing element that has a solid electrolytic sheet and an insulating sheet that are laminated and then sintered so that they will be bonded together.

Because the materials that comprise these two ceramic sheets differ from one another, the applicants recognize that they need a little help bonding firmly together.

There have been various attempts in the past made, you know, providing some sort of an intervening sheet, things of that sort, to enhance the bond.

But what the inventors found was that they can enhance the bond if the solid electrolytic sheet that contains zirconia and yttria, which is the -- one of the two ceramic sheets I mentioned, if it further includes silicone dioxide or if both the solid electrolytic sheet and the insulating sheet, which contains aluminum, contains the silicone dioxide, so it can be in

one of the ceramic sheets or in both.

Apparently, when silicone dioxide is incorporated in the sheet or sheets as our applicant has proposed, what happens when the ceramic sheets, the laminated sheets, are sintered is a liquified crystal phase containing silicone dioxide appears between the two ceramic sheets.

And apparently this liquid crystal phase that appears generates a material transfer between the portions of the ceramic sheets via this liquified phase.

Because of this material transfer, what happens is you have a very tight bond. In fact, through experiments that are detailed in the specification, the applicant has found that including this material not only improves bondability of the two ceramic sheets but also bonding strength.

In rejecting the claims, what the Examiner has done is cited a number of references that the Examiner says in combination meet the limitations of the claims. The first reference, Tatumoto, the Examiner cited because it includes the basic structure of the gas sensing element.

In other words, the solid electrolytic sheet that contains zirconia and yttria and an insulating sheet that contains alumina and they are laminated and sintered but there is no mention of the silicon dioxide in the Tatumoto reference so the Examiner has cited three other references in addition to our own specification to create the invention from that.

The first two references the Examiner cited, one is Kobayashi. Kobayashi does mention the use of silicone dioxide in a solid electrolytic sheet but the difference there is that Kobayashi specifically teaches that this material is provided in order to modify the thermal expansion coefficient so that you are not going to have a cracking and breakage of the gas sensing

element.

The second reference, Nanataki, also teaches the incorporation of silicon dioxide but teaches it, again, as related to thermal shock resistance so that you won't have a cracking of the gas sensing element when exposed to the variant temperatures that a gas sensing element will be exposed to.

So each of these references does mention this particular material but the applicant feels quite strongly that neither of these secondary references includes any teaching or suggestion that if you incorporate silicone dioxide, it will result in increased bondability and importantly strengthen a bond between adjacent ceramic sheets.

In particular, they don't teach that it is going to enhance the bond due to the formation of crystal phase that contains the silicon dioxide between the two ceramic sheets and results in material transfer.

When we argued that to the Examiner, the Examiner cited Fujishiro, another reference, which the Examiner says teaches a bonding phase containing silicon dioxide.

And we take issue with that because Fujishiro, which is actually talking about bonding, ceramic structure to a metallic component, I think they have characterized it as a conductive member, 32 or 34, so they have electrolyte cylinder and then they have a conductive member they want to attach to each end of that cylinder.

And what they teach is that you can attach them by providing a metal coating on the electrolyte cylinder and then soldering the conductive member to it.

Now, Fujishiro mentions silicone dioxide and says that if you incorporate silicone dioxide in the electrolyte cylinder, then what you are

going to do is enhance the adhesion of this metal coating that is applied that you then solder to the conductive member.

Fujishiro mentions that the silicone dioxide -- specifically says that the silicone dioxide forms a secondary phase distinct from the solid solution phase of the ceramic material.

And the Examiner has pointed to the secondary phase and said, well, there you go, it shows that the silicone dioxide rises to the surface.

Well, I think that what this says is two things. One, it is in a phase distinct from the solid solution phase but it doesn't say that this secondary phase is a crystal phase and it doesn't say that it rises to the surface, particularly during sintering.

It simply says that there is a secondary phase present in the material, and while there may be some exposure of that silicone dioxide at the surface, there is no teaching of, in essence, a crystal phase forming during sintering between two components that you are laminating and sintering together.

So, again, what the applicant feels strongly is that there is a teaching of silicone dioxide but it doesn't specifically teach that you are going to strengthen a bond between two ceramic sheets or that a crystal phase will form between the two sheets on sintering.

JUDGE HANLON: The Examiner's position is that the crystal phase would inherent -- that secondary phase would inherently be crystal -- crystal phase. Your sintering with the same temperature, so --

MS. LESTER: Well, one of the arguments that the Examiner made -- I don't know if it was specifically about Fujishiro; I think it was about the two secondary references, Kobayashi and Nanataki.

The Examiner had said that the materials provided for a different purpose but you would inherently have the secondary crystal phase form, and Fujishiro says that there is a secondary phase.

I guess, again, where the applicants take issue with that is that Kobayashi and Nanataki only teach that there is any value having to do with the thermal coefficient -- expansion coefficient, rather, and the thermal shock resistance and doesn't motivate someone in this technology to go to or turn to the incorporation of silicone dioxide in order to enhance the bond.

Perhaps, you know, they would tell you, well, you want to incorporate silicone dioxide if you want to modify the thermal expansion coefficient or thermal shock resistance but doesn't suggest that the primary reference -- if you are wanting to increase the bond strength in the primary reference, that you would look to an incorporation of silicone dioxide.

So I guess, again, that's what they are focusing on is irrespective of what inherently might occur, they feel that the prior art doesn't teach the basic concept that it is going to strengthen the bond.

JUDGE HANLON: Looks like on page 8 of the Examiner's Answer, the Examiner does discuss this inherency -- "If silicon dioxide were added to the electrolyte mixture to be sintered, as Kobayashi and Nanataki provide motivation for, the crystal phase containing silicone dioxide would inherently have formed between the solid electrolyte layer and the insulating layer as evidenced by the instant invention and Fujishiro."

MS. LESTER: And that's where, unfortunately, while I am familiar with the technology, I'm not an expert, so I don't know what would result if you would simply incorporate the materials for some other reason, what will occur. I think, again, what -- what my clients' upset is is having to

do with whether or not there is a teaching of increasing the bond strength.

JUDGE HANLON: So your issue with this is there is no motivation to combine these references?

MS. LESTER: I think that's what I would have to say is that we have the basic structure in Tatumoto, and then you look to, well, what would someone skilled in this art, not knowing what we are doing, do to improve the bond strength of Tatumoto?

And perhaps they would look to one of the prior art methods of increasing bond strength such as those discussed in the background of the invention section but they wouldn't necessarily look to a reference that is adjusting the thermal shock resistance or the thermal expansion coefficient in seeking to improve the bond strength.

And I guess that's where -- so there is -- there is a disconnect between, you know, where my client is focussing on where their invention lies, and that is discovering how you can improve the bond strength, whereas the prior art maybe is addressing other issues such as thermal expansion coefficient or thermal shock resistance but they are not teaching that it is actually able to achieve an improve bond strength.

JUDGE HANLON: Thanks.

MS. LESTER: Are there any questions?

JUDGE KIMLIN: I think that about covers it.

MS. LESTER: Okay. Thank you.

JUDGE KIMLIN: Thank you for coming.

Whereupon, the proceedings at 2:29 p.m. were concluded.